

Value Creation Through Integration Workshop

Lean Aerospace Initiative



A Framework for Integration from the Manufacturing Perspective

January 30, 2002

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- **Industrial product maturity impact on manufacturing**
- **What is manufacturing system design**
- **The manufacturing system design framework**



- **Product differentiation harder to achieve**
- **Product performance enhancements best satisfied by incremental improvements**
- **Acquisition and life cycle costs predominate**
- **Insertion of process technologies has highest leverage**

Use Manufacturing for Competitive Advantage



How can Manufacturing be Used for Competitive Advantage?

- **Product design alone is less of a discriminating factor for competitive success therefore ...**
 - **Design efforts should ensure producibility**
 - **Manufacturing inputs should carry more weight**
- **Process technology development yields most benefits**
 - **Continual introduction of new processing capabilities**
 - **Organizational elements to champion process developments**

Elements for a Manufacturing System Design Framework

- A holistic view of manufacturing system design environment
- Visual depiction of “design beyond factory floor” ideas
- Manufacturing as part of the product strategy
- *Manufacturing system design is strategy driven, not product design driven*
- Combines multiple useful tools
- Provides insights into order and interactions
- Not prescriptive
- Can lead to innovative & new manufacturing system designs
- Shows the unending design cycle -- Continuous Improvement

1. Manufacturing system “infrastructure” design

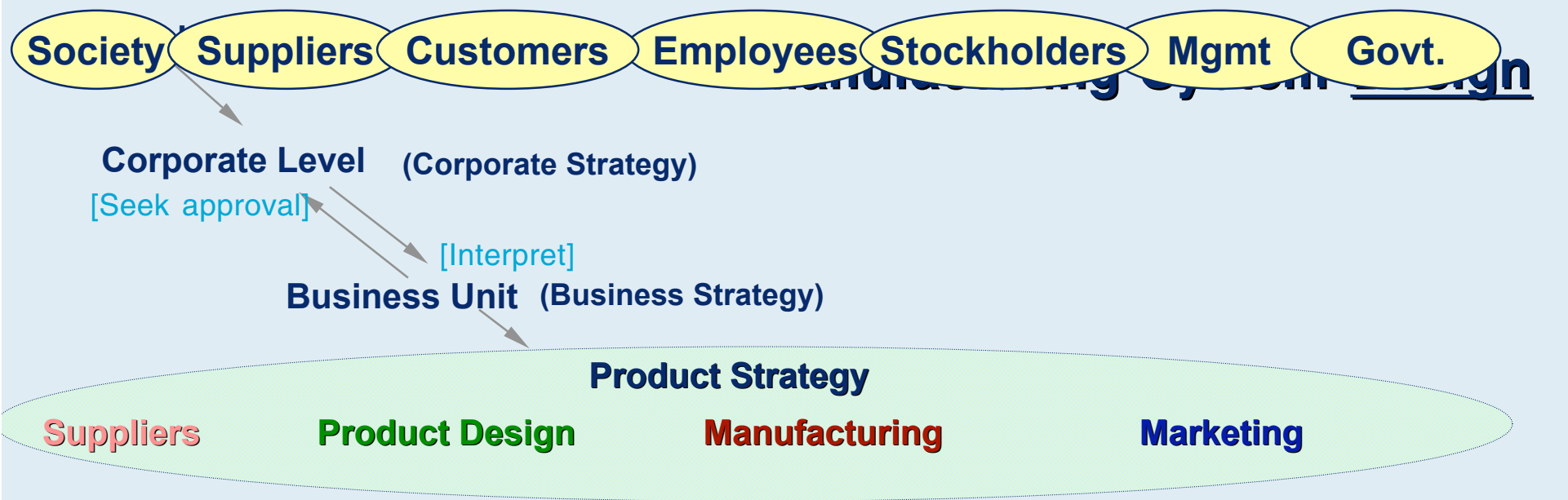
- Manufacturing strategy
- Operating policy
- Partnerships (suppliers)
- Organization structure details

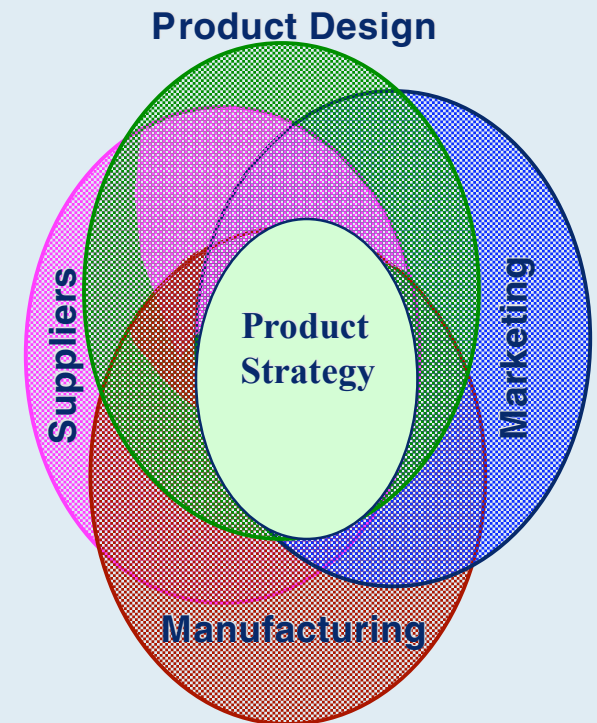
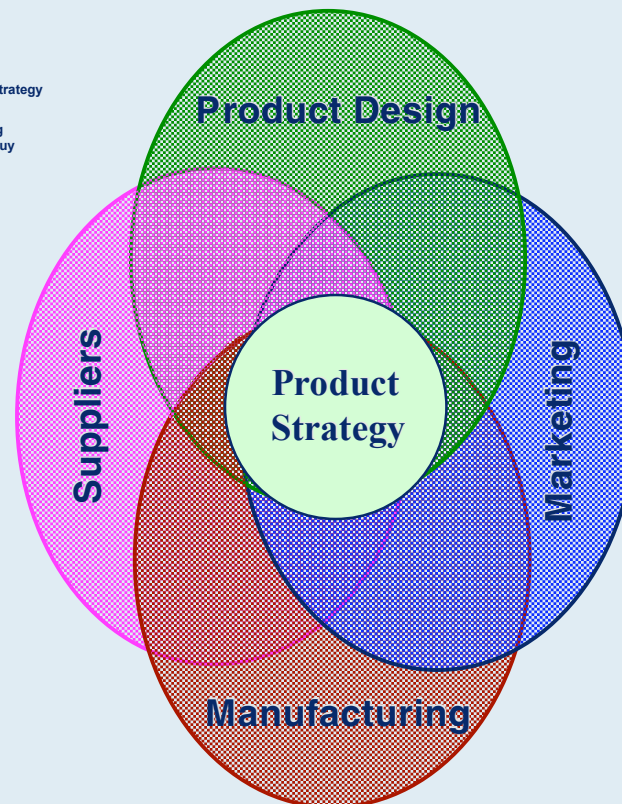
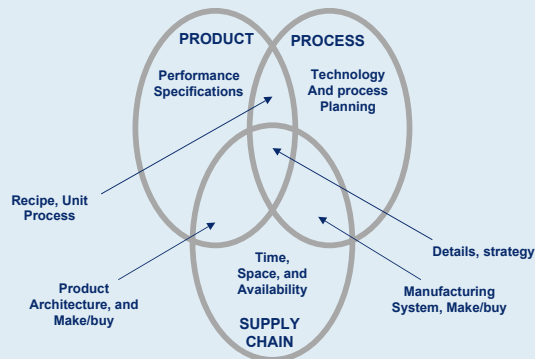
*Manufacturing
Strategy Tools*

2. Manufacturing system “structure” design

- Buildings, location, capacity
- Machine selection
- Layout
- WIP

*Manufacturing
System Design
Tools*





Manufacturing System Design

Stakeholders

Corporate Level

[Seek approval]

[Interpret]

Business Unit

Product Strategy

Suppliers

Product Design

Manufacturing

Marketing

Make/Buy
Risk-sharing Partnerships

DFMA, IPT
3-DCE
Concurrent Engineering

Customer Needs
Technical Feasibility
Feasible performance guarantees

Requirements/Considerations/Constraints

- Miltenburg, - 3P, - 2D plots,
- MSDD, - AMSDD - design Kaizen

Manufacturing System Design/Selection

- Analytical Tools,
- Simulation Tools

Implement (pilot)

Fine Tune

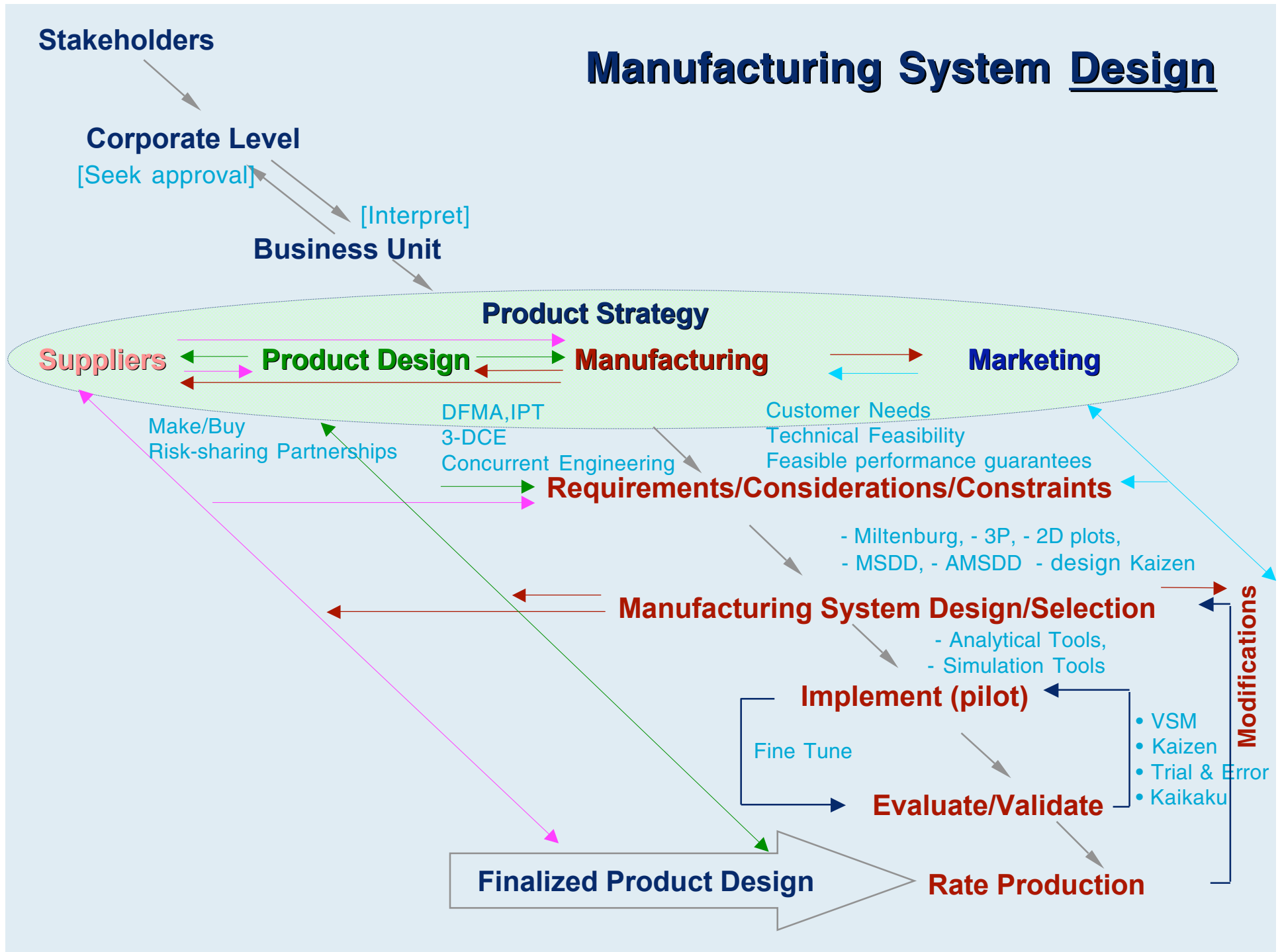
Evaluate/Validate

- VSM
- Kaizen
- Trial & Error
- Kaikaku

Modifications

Finalized Product Design

Rate Production



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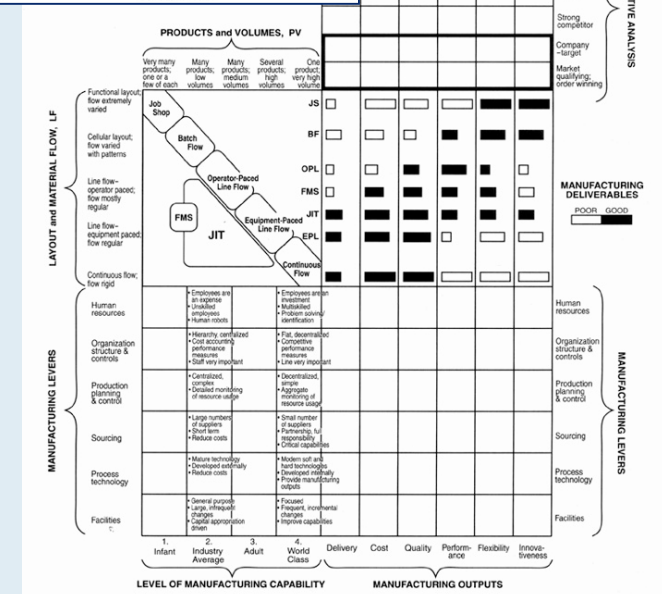
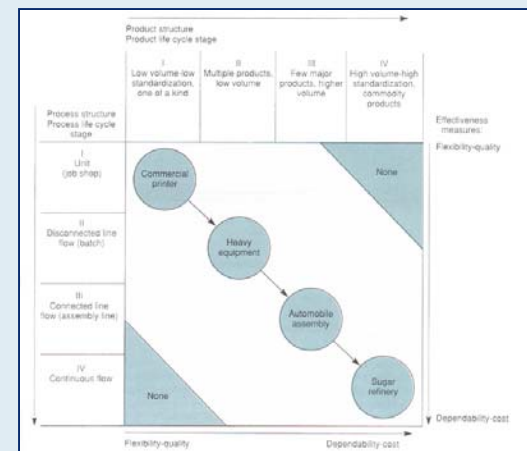
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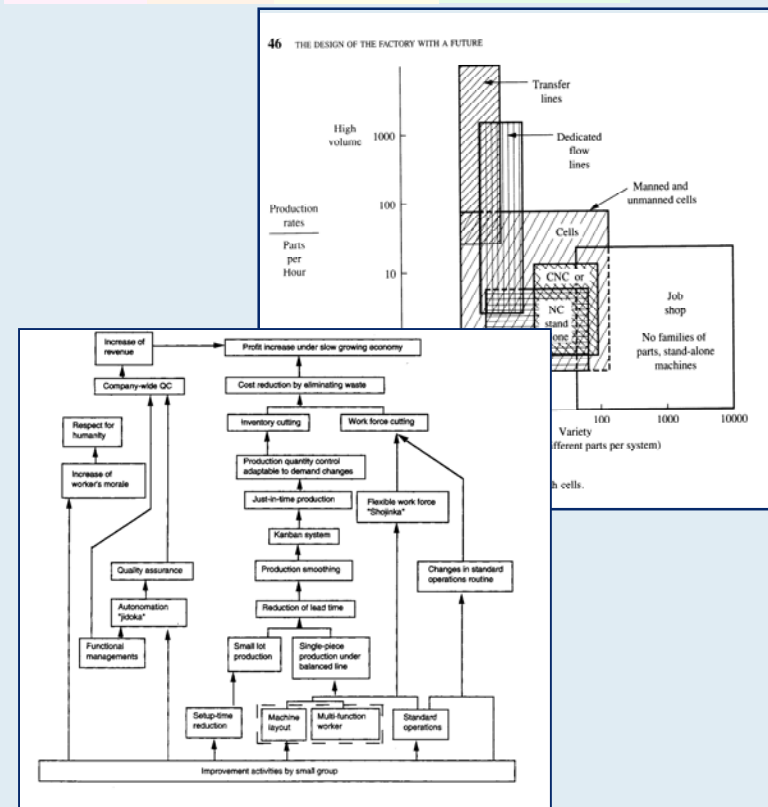
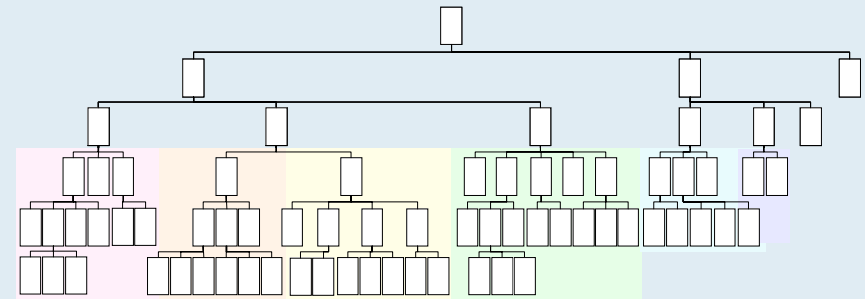
Finalized Product Design

Rate Production

- Focused Factory
 - Wickham Skinner
- Product-Process Matrix
 - Hayes and Wheelwright
- 3-DCE
 - Charlie Fine
- Nine Components of Manufacturing Strategy
 - Fine and Hax
- Manufacturing Strategy Worksheet
 - Miltenburg



- Axiomatic design/MSDD
 - Cochran
- Production Preparation Process (3P)
- 2-D manufacturing world maps
- Toyota production system frameworks
 - Ohno, Shingo, and Monden
- Various analytical tools/computer simulation tools



- **Manufacturing system design is more than the factory floor**
- **Manufacturing system design is strategy driven**
- **There is no one size fits all general manufacturing system design methodology**
- **Best results realized by interacting with design, suppliers and marketing**
- **Manufacturing is a competitive weapon in a maturing product industry**